

Method and Machine Tool for Machining Running surfaces of a Train Wheel Set

The invention relates to a method and a machine tool for machining running surfaces of a railroad wheel set.

A machine for machining of running surfaces of a railroad wheel set by grinding has become known e.g. through US patent 2,754,630. In this machine the wheel set is received between the back centers of two tailstocks and is imparted rotation by a friction roller while the running surface is profiled by means of a grinding tool. Two friction rollers are provided in particular and do not attack at the circumference of the running surface vertically below the wheel set held between the back centers but laterally thereof. Running surfaces of railroad wheel sets can be machined essentially only by grinding with the known machine because considerably great cutting forces that do not allow for precise machining of the wheel set without strong support in the machine frame occur for the machining e.g. by turning or milling than by grinding. The machine frame of the known wheel set grinding machine is supported on runners and is thus movable.

Furthermore a method and a machine for the machining of railroad wheels is known from DE 100 25 724 A1 whose machine frame is also designed so as to be movable. The wheel disks or brake disks of a railroad wheel or wheel set rotatably supported in bearing housings are grasped by a chuck engaged at least at one bearing housing in that the wheel set with a wheel set is pressed at the latter's circumference against supporting rollers of which at least one causes the railroad wheel or the wheel set to rotate while at the same time a tool machines one of the wheel or brake disks. This machine is especially well suited to machine railroad wheels or wheel sets built onto the

vehicle while they are being machined. Due to its mobility the machine can also be used economically to machine small-size batches.

This leads to the object of the present invention to further improve the known methods and machines and to provide also for the machining of running surfaces that were recently installed on the wheel disks of railroad wheel sets. The advantage of mobility should at the same time benefit economic utilization for smaller-size batches.

According to the invention, the object is attained by two separate processes:

1. By placing the wheel set with both wheel disks on several supporting and drive rollers of a mobile wheel set machine,
 - by receiving and centering the wheel set axle between the back centers of two supported tailstocks,
 - by ascertaining the position of the wheel set relative to the center of the machine,
 - by adjusting a tool for the machining of the running surface of at least one of the two wheel disks of the wheel set first in Z direction of the machine in function of the result of the ascertainment,
 - by imparting rotation to the wheel set with at least one of the supporting and drive rollers,
 - by then planing the back of the running surface by means of the tool,
 - by supporting the planed back of the running surface in direction Z and
 - by profiling the supported running surface by means of a tool.

2. Or by receiving and centering the wheel set axle between back centers of two supported tailstocks of a mobile wheel set machining machine,
 - by ascertaining the position of the wheel set relative to the center of the machine,
 - depending on the result of the ascertainment, by adjusting a tool for the machining of the running surface of at least one of the two wheel disks of the wheel set,
 - by pressing a drive roller against at least one of the two wheel disks of the wheel set and imparting rotation with it to the wheel set,
 - by then planing the back of the running surface by means of the tool,
 - by supporting the planed back of the running surface in direction Z and
 - by profiling the supported running surface by means of a tool.

The term “profiling” means the chip-removing machining of the outer contour of the wheel’s running surface. This machining can be carried out by turning, milling or, as is known, by grinding.

The position of the wheel set in relation to the center of the mobile machine is ascertained e.g. by tracing a shoulder or relief of the wheel set axle by means of a tracer. Following this, the back of one or both running surfaces of the two wheel disks of the wheel set are planed, each by means of a tool. During this planing the AR distance between the two backs of the running surfaces is at the same time adjusted. The “AR distance” is the distance between the two wheel disks. The AR distance is measured from

wheel back to wheel back of the two running surfaces of a wheel set. In addition to the AR distance, the QR distance is also significant. The QR distance is the wheel gauge between rubbing faces of inner wheel flanges as measured at the point of transition from running surface to wheel flange.

When the backs of the two running surfaces have been planed and when the AR distance has been reached, the wheel disk is supported in Z direction by means of a roller for the profiling of the running surfaces. Supporting the wheel disks ensures that the wheel disk does not warp in such manner during the subsequent profile machining as to cause lack of precision in the production result. As soon as the AR distance or the QR distance has been adjusted, a program takes over the control of the tool carriages for the profiling of the running surfaces.

Brake disks that may also be present on the wheel set are also machined by means of a tool. It may be advantageous to use the same tool for the machining of the running surfaces and of the brake disks.

A machine tool for machining of running surfaces and/or brake disks of railroad wheel sets by chip-removing machining is characterized by

- a movable machine frame,
- two back centers capable of being displaced along a tailstock, at a distance from each other in Z direction of the machine frame equal to the length of the wheel set axle and aligned with each other,
- a common support of the two tailstocks,
- at least one supporting and/or drive roller suitable to be pressed against the running surface of at least one of the two wheel disks of the wheel set,

- at least one installation for the ascertainment of the position of the wheel set in Z direction relative to the center of the machine frame,
- at least one tool carriage with at least one tool,
- a forward feed to move the tool carriage at least in X and Z direction and
- a support of the running surface to be re-profiled, in Z direction.

The common support of the two tailstocks can consist of a yoke on each tailstock and of two tow bars connecting the two yokes to each other, extending along the machine frame on either side of the wheel set held between the back centers.

It is advantageous if two supporting and drive rollers are provided for each wheel disk of the wheel set. As a result the torque transmitted per supporting and drive roller can be kept low, so that no slippage occurs between the drive and the running surface. For this arrangement the two supporting and drive rollers are installed at a distance from each other nearly vertically below the wheel set held between the back centers. Such an installation makes it also possible to place the wheel set on the supporting and drive rollers before it can be held between the back centers. This arrangement is especially advantageous for the implementation of the method according to claim 1.

When setting a wheel set on the two supporting and drive rollers it is advantageous if the supporting and drive rollers can be moved in direction X. In this manner the wheel set placed on the rollers can be lifted to a level at which the wheel set axle can be received between the back centers.

To ascertain the position of the wheel set relative to the machine frame, a tracer is provided that can be displaced at least in Z and X direction. In addition to the mobility in X and Z direction it is also advantageous if the tool support can also be displaced in direction Y. As a result the possibilities increase for the placement of the tool holder for tools and tracers. In this sense the tool carriage is also equipped with a tool holder which makes either the holding of machining tools for the running surfaces and/or the brake disks or a tracer.

Finally a supporting roller is provided which is born rotatably and can be displaced along direction Z, being capable of absorbing forces acting in Z direction. By means of this supporting roller the wheel disk is supported during profiling of the running surface on the latter's outer circumference, so that the wheel disk does not warp under the stress of chip removal.

The invention is described in further detail below through an example of an embodiment.

At reduced scale

Fig. 1 shows a machine tool in a front view

Fig. 2 shows the support of a tailstock in a top view

Fig. 3 shows a tool carriage in a front view

Fig. 4 shows an enlarged detail "A" from Fig. 3 and

Fig. 5 shows an enlarged detail "B" from Fig. 1.

On the side next to Fig. 1 the main work or feed devices of the turning machine are shown in perspective. These are the Z direction corresponding to axis of rotation 24 of the wheel set axle 7, X direction corresponding to the perpendicular to the machine

frame 5 and Y direction corresponding to a perpendicular to the plane of the drawing of Fig. 1.

The machine tool for the machining of running surfaces 1 and/or brake disks 18 of railroad wheel sets 2 is provided with a movable machine frame 5. The mobility of the machine frame 5 is made possible e.g. by rollers 6 running on rails 23. Two back centers 8 are supported in a tailstock 9 and are capable of being displaced and rotated. The back centers 8 are at a distance from each other in Z direction of the machine frame 5 that is equal to the length of the wheel set axle 7. The two tailstocks 9 are supported mutually, each via a yoke 20 and two draw bars 21 (Fig. 2).

Two supporting and drive rollers 4 are provided for each wheel disk 3 of the wheel set 2. The two supporting and drive rollers 4 are at a distance from each other in Y direction and are nearly vertically below the wheel set 2 held between the back centers. In addition the two supporting and drive rollers 4 can be adjusted and fixed in X direction. Thus the wheel set to be machined can be placed first on the supporting and drive rollers 4 and can be lifted by these to a level at which its axis of rotation 24 is aligned with the two back centers 8.

Before starting machining, the precise position of the wheel set 2 relative to the longitudinal center 10 of the movable machine frame 5 is ascertained. For this purpose a tracer 16 is brought into contact with a shoulder 15 or relief, whereby it is assumed that the wheel set axle 7 has already undergone a preparation in the course of which the two wheel disks 3 have been brought into the planned position on the wheel set axle 7. The tracer 16 is seated in a tool receptacle 22 which is part of the carriage 19. Upon

ascertaining the position of the wheel set 2 relative to the longitudinal center 10 of the machine frame 5, the tracer 16 is taken out of the tool receptacle 22 and in its stead cutting tools 11 and 14 are inserted into the tool receptacle 22. By displacing the carriage 19 in Z and X direction during simultaneous rotation of the wheel set 2, the back 12 of the running surface 1 can first be planed. The two backs 12 of the two running surfaces 1 are planed first and at the same time the AR distance 13 is adjusted. After the planing of the two running surface backs 12 the cutting tool 1 is again disengaged and is applied to the front 25 of the running surface by a movement of the carriage 19 in Z and X direction. Finally the running surface 1 is profiled as shown in Figs. 1, 2 and 3 by means of the cutting tool 14 while the tool carriage 19 moves in accordance with a control program by means of the built-in advance feed (not shown). During this profiling the wheel disk 3 is supported on the back 12 of the running surface 1 by a roller 17 in Z direction. The roller 17 rotates together with the rotating wheel set 2.

In addition to the profiling of the running surfaces 1, it is also possible to plane the brake disks 18 by means of the cutting tools 11 or 4 or by means of special tools inserted into the tool receptacle 22. As can be seen in the figures, the two brake disks 18 are seated on the wheel set axle 7 within the AR distance 13.